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TWO NEW STONEFISHES (PISCES, SCORPAENIDAE) FROM THE INDO-WEST PACIFIC, WITH A SYNOPSIS OF THE SUBFAMILY SYNANCEIINAE

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Abstract. Two new stonefishes are described and placed tentatively in the genus *Synanceia*. A discussion of the limits of the subfamily Synanceiinae is given, and six genera (*Synanceia*, *Erosa*, *Dampierosa*, *Trachicephalus*, *Leptosynanceia*, and *Pseudosynanceia*) are recognized. Related genera are discussed as are nomenclatural problems. Brief descriptions and illustrations are provided for the species referable to the scorpionfish subfamily Synanceiinae.

Introduction

The common name 'stonefishes' is applied here to all members of the scorpionfish subfamily Synanceiinae, although the name is more commonly used only for the fishes of the genus *Synanceia*. Species of the genus *Synanceia* are the most venomous of fishes, capable of causing death in man (see Halstead, 1970). Despite the interest in stonefishes, the species are poorly known, and it is of interest that two new species have been found. The new species are referred tentatively to the genus *Synanceia*, and their large venom glands suggest that they may be just as venomous as the better-known and larger-sized species *Synanceia horrida* and *S. verrucosa*. Generic allocation of the new species necessitated an examination of other genera and species believed to be related to the genus *Synanceia*. The genera referable to the subfamily Synanceiinae contain few species and most of the species (nine or ten) are rarely en-

countered, so that it was thought desirable to provide a brief synopsis of the subfamily. Fishes of the subfamily Synanceiinae are restricted to the warm waters of the Indo-West Pacific faunal region. Some species are found on reefs, but other members of the subfamily occur on muddy or sandy bottoms in marine and brackish waters.

Acknowledgments

Specimens of the two new species were obtained from five sources: The United States National Museum of Natural History (USNM), Stanford University (SU) (collection now housed at the California Academy of Sciences (CAS)), the Zoological Survey of India (ZSI), the American Museum of Natural History (AMNH), and a collection made by Victor G. Springer in the Red Sea as a part of a joint project of the United States National Museum of Natural History and the Hebrew University in Jerusalem (HUJ), Israel. We are indebted to Springer and the late Dr. H. Steinitz for the loan of this Red Sea material. William Smith-Vaniz first brought to Eschmeyer's attention one of the new species in 1967. A. G. K. Menon (ZSI) provided information on a specimen in his care. Depositories of specimens other than those listed above include the British Museum of Natural History (BMNH), Rijksmuseum van Natuurlijke Historie (RMNH), Australian Museum, Sydney (AMS), Zoological Institute, University of Tokyo (ZIUT), and the Academy of Natural Sciences of Philadelphia (ANSP). Assistance by the staffs of these institutions has been most generous, and we especially thank A. Wheeler, M. Boeseman, J. Paxton, T. Abe, J. Atz, D. Rosen, and J. Böhlke for their assistance. Lillian J. Dempster has offered valuable help in the preparation of this and other papers on scorpionfishes. Her assistance with literature, selection of new scientific names, and editorial comments have been substantial. Support for this study came from the National Science Foundation grant GB-15811. A visiting scientist fellowship provided by the California Academy of Sciences allowed Rama Rao to participate in this study. The drawings were made by Katherine Smith. M. Giles, W. Freihofer, P. Sonoda, T. Iwamoto, J. Gordon, F. Steiner, B. Wesemann, C. Pape, and K. Boyer assisted in the project.

Methods

Methods follow those used by Eschmeyer (1969). Most scorpionfishes have the last two elements in the dorsal and anal fins united or close together at their bases and usually they are supported by a single pterygiophore. In the subfamily Synanceiinae, however, species of some genera have the last element single, well separated from the previous ray, and supported by its own pterygiophore. To distinguish between these two conditions the addition of "½" or the statement "last double" implies that the last soft ray is a double one and

the absence of "½" or the statement "last single" indicates that the last element is separate soft ray. In these fishes there is no depression or pit where the premaxillaries join, so measurements originating from the anterior end are taken from the symphysis of the premaxillaries.

Subfamily Synanceiinae

The limits of this subfamily are in doubt. Bleeker (1874) included *Pelor* [= *Inimicus*], *Synanceia*, *Leptosynanceia*, and *Polycaulus* [= *Trachicephalus*] in a family Synanceiidae (his "Synanceioidei"). J. L. B. Smith (1958) included the genera *Minous*, *Inimicus*, *Choridactylus*, *Synanceia*, and *Synanceichthys* in the family Synanceiidae (his "Synanciidae") for western Indian Ocean species. De Beaufort (*in* Weber and de Beaufort, 1962) included *Synanceia*, *Leptosynanceia*, *Polycaulus*, *Inimicus*, and *Minous* in the family Synanceiidae (his "Synanceidae") for Indo-Australian species. Matsubara (1943) treated *Minous* as a separate subfamily Minoinae, *Inimicus* as a separate subfamily Pelorinae, and studied only *Synanceia verrucosa* as a representative of the subfamily Synanceiinae. The genus *Erosa* is thought by us to be related to *Synanceia*; Matsubara (1943) treated the genus *Erosa* as a separate subfamily Erosinae. Non-Japanese genera were not studied by Matsubara.

At the present time we suggest the following allocation of these genera and their synonyms (see also generic synonymies in text for additional synonyms):

Synanceiinae: *Synanceia* (including *Synanceichthys*), *Leptosynanceia*, *Trachicephalus* [*Polycaulus* a synonym], *Pseudosynanceia*, *Erosa*, and *Dampierosa*.
Inimicinae (synonym Pelorinae): *Inimicus* [*Pelor* a synonym] (including *Chorismopelor*), *Choridactylus* (including *Choridactyloides*).
Minoinae: *Minous* (including *Corythobatus*, *Decterias*, *Lysodermus*, and *Paraminous*).

Species of the subfamily Minoinae are characterized externally by the presence of a free lower pectoral ray in each fin, while the species in the subfamily Inimicinae have two (*Inimicus*) or three (*Choridactylus*) free pectoral rays. (The monotypic genus *Cheroscorpaena* (Mees, 1964) has three free pectoral fin rays; subfamilial placement of this genus is uncertain, but it probably belongs near the distinctive genus *Apistus*.) Species of the subfamilies Minoinae and Inimicinae will be treated in subsequent articles.

One feature which might prove to be important in the classification of these fishes at the subfamilial level and below is the presence of what appear to be skin glands or organs. These apparently pored structures tend to be scattered over the body in fishes of the subfamily Synanceiinae. They are present in rows (usually above the anal fin or below the dorsal fin) in some genera, and in *Synanceia*, *Erosa*, and *Dampierosa* they are reflected as warts. In the subfamily Inimicinae these glands are concentrated in a widely spaced row above the

lateral line and in a patch behind the head. In the subfamily Minoinae, and presumably in other scorpaenoid fishes, they are absent. Frequently the glands contain a brown, hardened, wax-like substance in preserved specimens. A tiny buried scale accompanying each gland can be seen in alizarin-stained specimens. We do not know the function of these glands and have not studied them in detail.

The following trends are noted for the subfamily Synanceiinae:

1. Dorsal spines increase from 12 to 17 (occasionally 11 spines in those species which normally have 12 spines).
2. Dorsal soft rays decrease from 9 (10) to 4, but increase to 12–14 in one genus.
3. Fin spines change from firm and strong to flexible.
4. Pelvic rays are reduced from I + 5 to I + 3.
5. Pectoral fin rays decrease from about 18 or 19 to 11.
6. Eyes move to the dorsal surface of head; eyes become smaller.
7. Mouth shifts to a superior position.
8. Swimbladder is lost.
9. Vertebrae increase from 24 to about 30.

The definition of genera within the subfamily Synanceiinae is difficult, particularly because of the (probably 'rapid') evolution of certain features listed above as trends. For example, *Synanceia* is sometimes restricted to *S. horrida*, and *Synanceichthys* to *S. verrucosa* (as *verrucosus*) (Smith, 1958, p. 173). These 2 species and a presumed (by de Beaufort) hybrid (*S. platyrhynchus*) were treated in the genus *Synanceia* by de Beaufort (*in* Weber and de Beaufort, 1962); Whitley (1930) placed '*platyrhynchus*' in its own subgenus *Nofua*. The two new species described here further complicate this. One of the new species has 11 pectoral rays, and the other normally 14 rays, while '*platyrhynchus*' has 17, '*horrida*,' 15–17, and '*verrucosa*,' 18–19. Furthermore, one of the new species has the pelvic rays reduced to I + 4, as do some specimens referable to '*horrida*.' Given certain trends which occur in the subfamily, we do not feel that these differences are so important and we have expanded the genus *Synanceia*. We treat the genera *Erosa*, *Dampierosa*, *Trachicephalus*, *Pseudosynanceia*, and *Leptosynanceia* as monotypic, although more than one nominal species exists for some of these genera. Subsequent workers may wish to unite *Erosa* and *Dampierosa* in one genus.

Subfamily diagnosis. Scales absent; no free pectoral rays; skin glands present (appearing as 'warts' in some genera); dorsal spines 11–17, dorsal soft rays 4–14 (last single or double); anal spines normally 2–4 (difficult to distinguish spines from soft rays in some species), anal soft rays 4–14, total anal spines and rays 7–16; pelvic rays I + 5, I + 4, or I + 3; pectoral rays 11–19;

second suborbital bone (= third infraorbital) broad, not T-shaped, attached to preopercle; third and fourth suborbital (fourth and fifth infraorbital) bones absent; vertebrae 23 to 30.

KEY TO THE GENERA AND SPECIES OF THE SUBFAMILY SYNANCEIINAE

1. Mouth terminal, only slightly oblique; eyes placed laterally on head, directed outwards 2
   Mouth vertical or superior; eyes on dorsal surface of head, directed outwards and upwards or completely upwards 3
2. Dorsal spines 14; dorsal soft rays 5½ to 6½, usually 6½; anal spines 3; anal soft rays 5½ to 6½, usually 5½; pectoral fin rays 14–16, usually 15 ..... *Erosa erosa*
   Dorsal spines 12 (possibly 13); dorsal soft rays 9½ (possibly 8½); anal spines 2; pectoral fin rays 12 (11 or 13 should be expected) ..... *Dampierosa daruma*
3. Dorsal spines 16 or more 4
   Dorsal spines 11–14 5
4. Pelvic fin with 1 spine and 3 soft rays ..... *Pseudosynanceia melanostigma*
   Pelvic fin with 1 spine and 4 soft rays ..... *Leptosynanceia asteroblepa*
5. Anal fin with 3 spines and 4½ (5) to 6½ (7) soft rays, total anal fin elements 7–10 6
   Anal fin with 2 spines and 12–14 soft rays, total anal fin elements 14–16 ..... *Trachicephalus uranoscopus*
6. (3 choices) Pectoral fin rays 11 (10 or 12 should also be expected) ..... *Synanceia alula*
   Pectoral fin rays 14, rarely 15 (13 should be expected; one type specimen with 15 on left, 16 on right) ..... *Synanceia nana*
   Pectoral fin rays 15 or more (if 15 or 16, eyes will have a crest above them) 7
7. Pectoral fin rays 18–19; no bony crest above eye ..... *Synanceia verrucosa*
   Pectoral fin rays 15–17; bony crest present above eye 8
8. Ridge connecting eyes across interorbit continuous, with no break in middle ..... *Synanceia horrida*
   Eyes nearly connected by a bony ridge across interorbit but with a concavity at center [a species of uncertain status] ..... *Synanceia platyrhynchus*

Genus **Synanceia** Bloch and Schneider

Synanceia BLOCH and SCHNEIDER, 1801, p. xxxvii (brief description; listed species; type-species *Scorpaena horrida* Linnaeus by subsequent designation of Jordan, 1919, p. 58).

Synanceja BLOCH and SCHNEIDER, 1801, p. 194 (brief description; species descriptions; misprint for *Synanceia* [corrected in corrigenda on p. 573, see 'Nomenclatural remarks']).

Synanchia SWAINSON, 1839, pp. 61, 180–181 (unjustified emendation of *Synanceia* [see 'Nomenclatural remarks']; three subgenera).

Bufichthys SWAINSON, 1839, p. 268 [but not pp. 180–181] misprint for *Synanchia* [see 'Nomenclatural remarks']).

Synancidium MÜLLER, 1843, p. 302 (type-species *Scorpaena horrida* Linnaeus by subsequent designation of Swain [see 'Nomenclatural remarks']; Müller proposed the genus for "*Synanceia* mit Vomerzähnen").

Synancydium, AGASSIZ, 1845, p. 63 (unjustified emendation of *Synancidium* Müller).

Synanceichthys BLEEKER, 1863, p. 234 (type-species *Synanceia verrucosa* = *Synanceia brachio* by original designation).

Emmydrichthys JORDAN and RUTTER *in* Jordan, 1896, pp. 221–222 (type-species *Emmydrichthys vulcanus* Jordan and Rutter by monotypy).

Nofua WHITLEY, 1930, p. 24 (as a subgenus of *Synanceja* [sic]; type-species *Synanceia platyrhynchus* Bleeker by original designation).
Deleastes SEALE, 1906, pp. 80–81 (type-species *Deleastes daector* by original designation).

NOMENCLATURAL REMARKS. Much confusion exists over the spelling of this genus and its various synonyms, as well as the subfamily spelling. The genus is spelled *Synanceja* by many recent authors (e.g., Smith, Whitley, de Beaufort), but the correct spelling is clearly *Synanceia*. In the original description Bloch and Schneider, on page xxxviii, spell the name as *Synanceia*, on page 194 they spell it *Synanceja*, and in plate 45 *Synanceia*; in their "corrigenda" on page 573 they state "[page] 194. genus 50. scribe: *Synanceia*." Subsequent workers who have commented on this problem missed the corrigenda (e.g., Briggs, 1961, p. 164).

Gill (1905, p. 221, *et seqq.*) said of the problem of the genus *Synanceia* and some other genera, "Complication has resulted by reason of the intrusion of the incompetent Swainson into the field." Swainson (1839) did add considerable confusion, but this uncertainty easily can be resolved. As discussed by Gill, Swainson attempted to reclassify the "Synanceines" and named three subgenera, but in three places (1839: pp. 61, 180–181, and 268) Swainson variously interchanged names and diagnoses. Gill summarized the equivalent categories as follows:

p. 61	*pp. 180–181*	*p. 268*
Erosa	= *Bufichthys*	= *Synanchia* Cuvier (species *erosa*)
Synanchia	= *Synanchia*	= *Bufichthys* (species *horrida* and *grossa*)
Trichophasia	= *Trachicephalus*	= *Trachicephalus* (species *elongatus*)

Gill allocated the individual treatments by Swainson to the genera *Synanceia* and *Erosa* of other authors. *Trichophasia* and *Trachicephalus* were synonymized by Gill and he serves as first revisor selecting *Trachicephalus* over *Trichophasia*. Problems remain only for Swainson's subgenera *Erosa*, *Synanchia*, and *Bufichthys*. Authors, e.g. Swain (1882), Jordan and Starks (1904), Jordan (1919), and Whitley (1930), as well as Gill, consider Swainson's *Synanchia* an emendation of *Synanceia*, although Bleeker (1874, pp. 4,11) indicated that the species '*crosa*' could be placed in *Synanchia* of Swainson. *Synanchia* is an unjustified emendation and cannot be used as a separate genus for the species '*crosa*' as by Bleeker (see Gill, 1905). It is clear from Swainson's text (but not from p. 268) that he intended first *Erosa* and then *Bufichthys* for the species '*crosa*.' It therefore appears that on page 268 Swainson switched the two headings *Bufichthys* and *Synanchia* (compare particularly his diagnosis and subgeneric categories on pp. 180–181 with p. 268).

Swain (1882, p. 277), in his review of Swainson's genera, dealt only with the entries on Swainson's pages above 200 (*i.e.*, p. 268 but not pp. 61 or 180–

181) and was therefore not aware of the switched headings. Unlike Gill, Swain referred *Bufichthys* to *Synancia* [*Synanceia*] and selected '*horrida*' as the type-species of *Bufichthys*. But *Bufichthys* p. 268 is really *Synanceia* while *Bufichthys* on p. 181 is really *Erosa*. Swain's selection of '*horrida*' as the type of *Bufichthys* of p. 268 does not affect the type-species for *Bufichthys* on p. 181. The type-species of *Bufichthys* is really '*erosa*' by monotypy. (It does appear that Swain was in fact the first to select the type-species '*horrida*' for *Synancidium* Müller; see Swain's footnote 4 on p. 277; Jordan, 1919, also regarded '*horrida*' as the type-species of *Synancidium* Müller.)

Bufichthys Swainson (on p. 181) is the original generic description of *Bufichthys*, and Gill (1905, p. 223) serves as the first revisor selecting the genus *Erosa* Swainson (p. 61) over *Bufichthys*. This interpretation seems to have been the aim of Swainson and corresponds to current usage.

Generic diagnosis. Dorsal fin normally with 13–14 spines and 4½–5 to 7½–8 soft rays (last ray usually double); anal fin normally with 3 spines and 4½–5 to 6½–7 soft rays (last soft ray usually double); pectoral fin rays 11–19; pelvic fin rays I + 5, or I + 4 in some specimens and in one species; mouth vertical; eyes directed mostly upwards; vertebrae usually 24; swimbladder absent; body covered with warts.

Remarks. The limits of the genus *Synanceia* are discussed in the subfamily section and reasons for placing some of the nominal genera in the synonymy of *Synanceia* are discussed above.

The genus *Emmydrichthys* Jordan and Rutter was based on a specimen of *S. verrucosa* with an abnormal dorsal fin. *Deleastes* was established by Seale for a species which he thought had shorter pelvic fins, pelvic fins located more posteriorly, and a smoother skin (see our account of *S. verrucosa*).

Synanceia nana Eschmeyer and Rama Rao, new species.
(Figures 1–2; tables 1, 3–5.)

No literature applies to this species.

Holotype. USNM 209417 (a specimen 73.2 mm. in standard length), Red Sea, Israel, northwest coast of the Gulf of Aqaba, bay at El Himeira, depth of capture to 18 meters, Victor G. Springer and assistants, 1100–1230 and 1315–1415 hours, 16 July 1969.

Paratypes. CAS 14991 (1, 47.8), taken with the holotype; CAS 14992 (2, 21.3–39.7) and HUJ uncatalogued (1, 70.5), Red Sea, Israel, Gulf of Aqaba, bay at El Himeira, in 9–12 meters, Victor G. Springer and assistants, 0945–1215 hours, 8 September 1969; USNM 209418 (1, 24.0), Red Sea, Israel, Gulf of Aqaba, between Marset Mahash el Ala and Marset Abu Samra, 32 kilometers as road goes south of Marine Laboratory, in depths to 3.5 meters, Victor G. Springer and assistants, 1030–1300 hours, 2 September 1969; USNM 209419

Figure 1. *Synanceia nana*, holotype, USNM 209417, 73 mm. S.L., Red Sea.

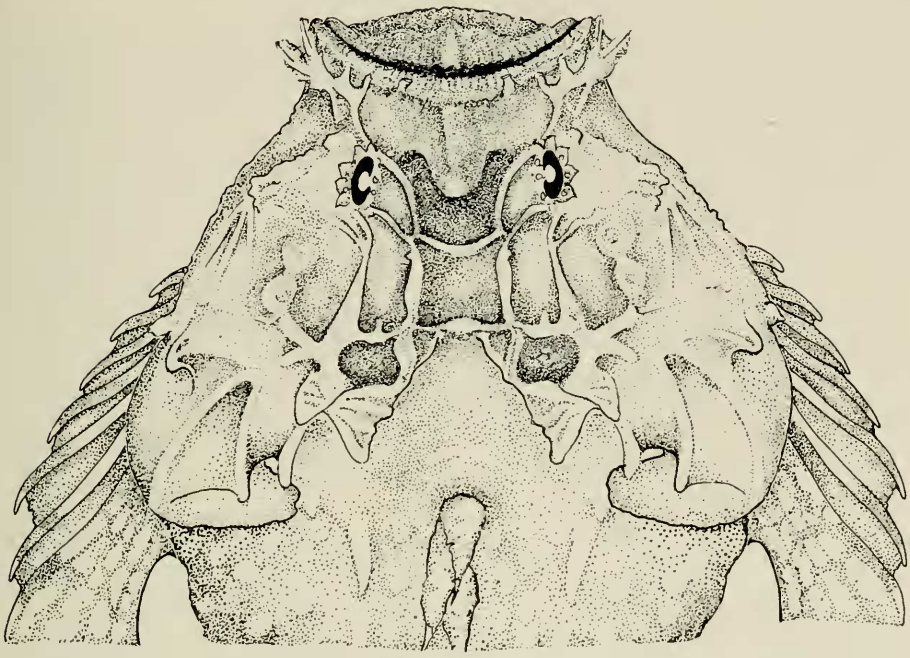

Figure 2. Drawing of head of *Synanceia nana*, based mostly on the holotype, 73 mm. S.L.

(1, 52.8), Red Sea, Gulf of Suez, Et-Tur, Sinai Peninsula, 100 kilometers north of Sharm el Sheikh as road goes, depths to 9 meters, Victor G. Springer and assistants, 1015–1315 hours, 27 September 1969; CAS 14993 (1, 71.5), Red Sea, Gulf of Suez, off Port Safâga, 27°16′15″N., 33°47′30″E., in 3 meters, H. A. Fehlmann and H. K. Badwi, 6 January 1965; AMNH 18385 (1, 102), Saudi Arabia, Persian Gulf, Tarut Bay, near Ras Tanura spit, R. Bowen, July 1947.

Distinguishing features. Dorsal XIV–XV (usually XIV) + 5; anal III + 4 to 6 (usually III + 5); pectoral 14–15(16), usually 14; pelvic I + 5; head broad, depressed, with pits; no large pit below eye; deep depression between eyes; rectangular depression on occiput.

Description. Dorsal fin with 14 spines (15 in one specimen); all spines short, nearly the same length, with thick skin covering the venom glands. Dorsal soft rays 5, all unbranched. Anal fin with 3 spines, first very short. Anal soft rays 4–6, usually 5, last single, all unbranched. Pectoral fin rays 14–15 (16 on one side in 1 specimen), usually 14, all unbranched. Pelvic fin with 1 spine and 5 unbranched soft rays. Gill rakers rudimentary, total 7–10, 0–2 on upper arch, 7–8 on lower arch. Lateral line with 10–12 tubes (including one on caudal), lateral line pores paler than nearby 'warts' in smaller specimens. Vertebrae 24 (7 specimens), or 23? (1), or 25 (1).

TABLE 1. *Counts and measurements for the type specimens of* Synanceia nana *(measurements are in mm., percent standard length in parentheses).*

	Holotype USNM 209417	CAS 14991	CAS 14992	CAS 14992	CAS 14993	USNM 209418	USNM 209419	HUJ uncat.	AMNH 18385
Standard length	73.2	47.8	21.3	39.7	71.5	24.0	52.8	70.5	102.0
Dorsal rays	XIV+5	XIV+5	XIV+5	XIV+5	XIV+5	XIV+5	XIV+5	XIV+5	XV+5
Anal rays	III+5	III+5	III+5	III+5	III+5	III+5	III+5	III+4	III+6
Pectoral rays	14,14	14,14	14,14	14,14	14,14	14,14	14,14	14,14	15,16
Pelvic rays	I+5,I+5	I+5,I+5	I+5,I+5	I+5,I+5	I+5,I+5	I+5,I+5	I+5,I+5	I+5,I+5	I+5,I+5
Vertebrae	24	24	24	24	24	24	23?	24	25
Head length	29.0 (40)	18.0 (38)	8.0 (38)	13.7 (35)	28.0 (39)	9.1 (38)	20.0 (38)	26.2 (37)	42.3 (41)
Body depth	28.0 (38)	17.2 (36)	7.0 (33)	13.2 (33)	23.5 (33)	8.4 (35)	18.2 (35)	23.0 (33)	39.6 (39)
Orbit diameter	3.6 (05)	2.3 (05)	0.8 (04)	1.4 (04)	3.1 (04)	1.5 (06)	2.8 (05)	2.5 (04)	4.7 (05)
Snout length	6.5 (09)	4.2 (09)	1.3 (06)	2.7 (07)	5.5 (08)	1.5 (06)	5.0 (09)	5.0 (07)	11.5 (11)
Interorbital width	7.5 (10)	4.8 (10)	2.0 (09)	3.3 (08)	8.2 (11)	2.8 (12)	4.8 (09)	6.8 (10)	12.8 (13)
Jaw length	13.1 (18)	8.0 (17)	3.5 (16)	7.0 (18)	12.5 (18)	3.5 (15)	9.2 (17)	12.3 (18)	19.0 (19)
Predorsal fin length	22.5 (31)	14.0 (29)	6.2 (29)	12.1 (30)	21.0 (29)	7.0 (29)	15.6 (30)	20.5 (29)	32.0 (31)
Pectoral fin length*	43.0 (58)	25.7 (54)	10.5 (49)	20.0 (50)	37.1 (52)	10.6 (44)	28.0 (53)	34.6 (49)	59.5 (58)
Pelvic fin length	22.5 (31)	13.0 (27)	6.8 (32)	11.3 (29)	20.0 (28)	7.5 (31)	16.5 (31)	20.8 (30)	31.1 (30)

* from base of lower ray to tip of fin

Body shape and coloration as in figure 1. Head (fig. 2) broad, depressed. Eyes elevated, directed up and out. Posterior interorbital area as a deep pit, bordered behind by a ridge which forms anterior edge of shallow rectangular occipital pit. No deep pit before and below eyes. Low crest on upper posterior corner of orbit. Most head spines difficult to distinguish; preorbital bone with main spine pointing down and slightly forward, two lumps or ridges on anterior edge. Supplemental and 4 preopercular spines present, all short. Other spines absent or developed as lumps or ridges. Body covered with warts. Small teeth on jaws and vomer; none on palatines.

Head and body pallid to tan, with darker brown areas, most notably dark on back between posterior part of spinous dorsal fin and anterior half of anal fin and at base of caudal fin. Pale irregular spots on a tan background on outside and inside of pectoral fin, fin pale in middle and dark distally. Other fins, except spinous dorsal, dark distally with tips of rays or margins white. Smallest specimens with posterior part of body and caudal and anal fin darker than in larger specimens.

Described from nine specimens. Probably a small species, largest available 102 mm. in standard length.

Comparisons. This species most resembles *S. verrucosa* in body and head shape but differs from it by having a lower pectoral ray count (14–15 versus 18–19) and a different dorsal ray count (usually XIV + 5 versus usually XIII + 6½). *Synanceia nana* lacks a pit below the eye, unlike *S. verrucosa*, *S. platyrhynchus*, and especially *S. horrida*. *Synanceia nana* has a rectangular depression on the occiput which is absent in *S. verrucosa*. *Synanceia nana* has a higher pectoral ray count than *S. alula* (14 or more versus 11). Other differences are given in the key or may be found by comparing 'Distinguishing features' sections.

Remarks. The single specimen from outside the Red Sea (Saudi Arabia, AMNH 18385, 102 mm. S.L.) has higher counts of dorsal, anal, and pectoral rays and one more vertebra (table 1), and is darker brown in coloration than the Red Sea specimens. It also has the tips of the inner pelvic rays joined to each other by skin rather than having the tips of the inner rays attached to the body. It is about 30 mm. longer in standard length than our largest Red Sea specimen. We feel it is referable to *S. nana*, but study of additional specimens from outside the Red Sea would be desirable.

Distribution. *Synanceia nana* is known from the type material from the Gulf of Suez and the Gulf of Aqaba in the Red Sea and from Saudi Arabia. Depths of capture range from about 3 to 10 m.

Name. The specific name '*nana*' is a Latin noun meaning dwarf or pygmy, alluding to the small size of this species.

Synanceia alula Eschmeyer and Rama Rao, new species.

(Figures 3–4; tables 2–5.)

Synanceia verrucosa, Keegan et al., 1964, fig. 26 (good photograph of a specimen from the Solomon Islands).

Holotype. SU 14673 (a specimen 85.0 mm. in standard length), Nicobar Islands, Nancouri Island, 8°N., 93°40'E., shore collection, *R.I.M.S. Investigator* station 615, 27 October 1921.

Paratypes. ZSI 289/2 (1, 72.0), taken with the holotype; USNM 209420 (2, 30.0–48.5), Solomon Islands, New Georgia, Munda Pier, in old coral, collected by W. Chapman, 7 May 1944; USNM 209421 (1, 27.8), Solomon Islands, New Georgia, Munda lagoon, collectors Chapman and Cheyne, 19 June 1944.

Distinguishing features. Dorsal XIII + 5½–6½; anal normally III + 4½–5½ (last soft ray usually double); pectoral 11; pelvic I + 4; head broad, depressed, large pit below eye.

Description. Dorsal fin with 13 spines; spines nearly same length, first shortest, second and third longest, covered by thick skin; venom glands prominent, on distal half of spines. Dorsal soft rays 5½–6½, branched distally, last ½ ray virtually a distinct separate ray (without dissection soft rays probably would be counted as 6–7). Anal fin with 3 spines (4 in one specimen) and 5½ (normally) or 4½ soft rays; first anal spine about half length of second; last anal soft ray usually double (but appearing as two close-set rays); anal rays branched distally except in small specimens. Pectoral rays 11, all rays branched at tips in largest 2 specimens. Pelvic fin with 1 spine and 4 soft rays, but 3 soft rays on left side of holotype. Gill rakers rudimentary, total 7–8, 0–1 on upper arch, 7 on lower arch. Lateral line tubes difficult to distinguish from 'warts,' about 11 lateral line scales. Vertebrae 24 (4 specimens).

Body shape and coloration as in figure 3. Head (fig. 4) broad, depressed; eyes elevated, with crest at upper posterior corner. Large pit below eye, largest in largest specimens; deep pit below parietal and nuchal spines. Occipital pit shallow or nearly absent. Most head spines developed as lumps or ridges, poorly defined. Preorbital bone prominent, main spine as a broad lump pointing down, with lateral ridges pointing anteriorly. Supplemental preopercular spine absent or fused with first preopercular spine; four preopercular spines present. Small teeth on jaws and vomer, none on palatines.

Head and body tan or brown, with darkest areas on back and between posterior portion of spinous dorsal fin and anal fin; a broad dark band at base of caudal fin. Dorsal fin brown in holotype (possibly discolored), paler in other specimens.

Described from 5 specimens. Probably a small species, largest available 85.0 mm. in standard length.

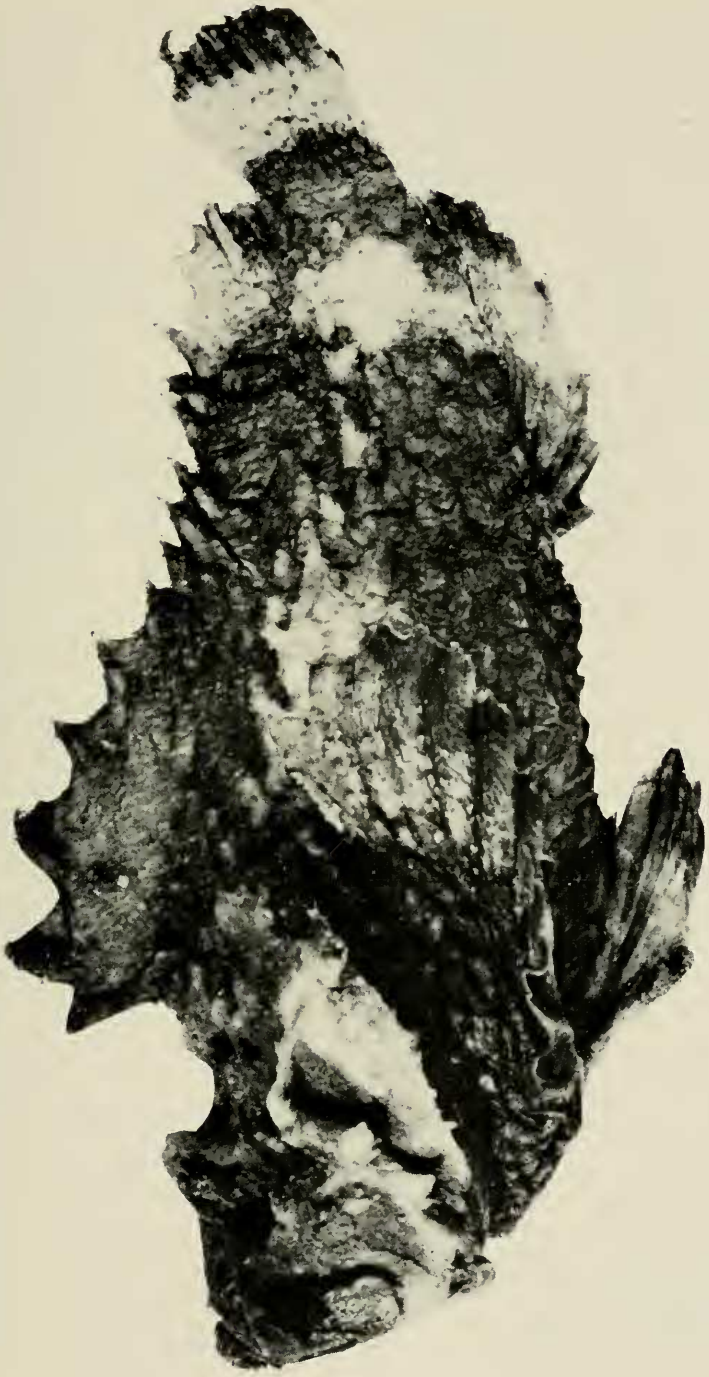

Figure 3. *Synanceia alula*, holotype, SU 14673, 85 mm. S.L., Solomon Islands.

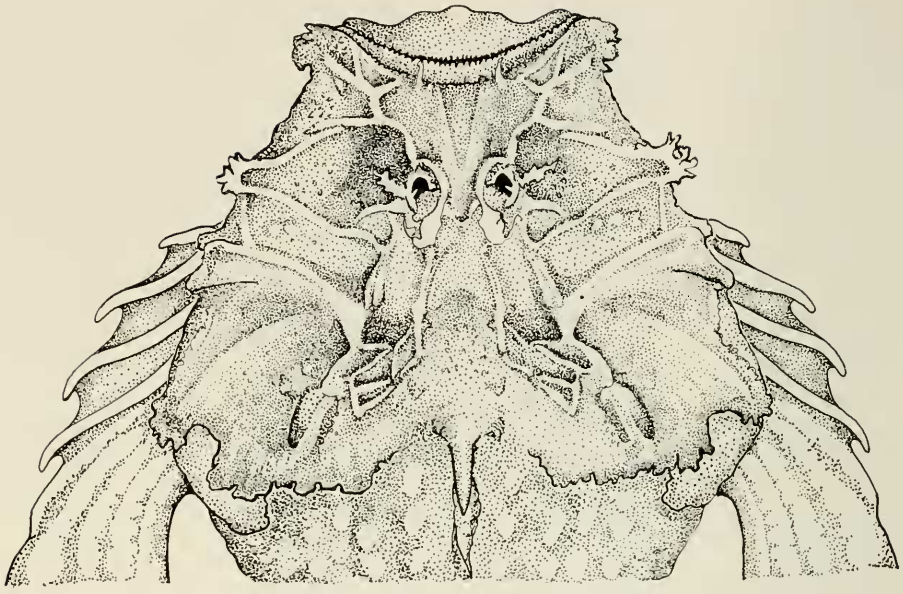

FIGURE 4. Drawing of head in holotype of *Synanceia alula*, 85 mm. S.L.

TABLE 2. *Counts and measurements for type specimens of* Synanceia alula *(measurements in mm., percent standard length in parentheses).*

	Holotype	Paratypes			
	SU 14673	ZSI 289/2	USNM 209420	USNM 209420	USNM 209421
Standard length	85.0	72.0	30.0	48.5	27.8
Dorsal rays	XIII+5½	XIII+6½	XIII+5½	XIII+6½	XIII+5½
Anal rays	III+5	III+5½	IV+4½	III+5½	III+4½
Pectoral rays	11,11	11,11	11,11	11,11	11,11
Pelvic rays	I+3,I+4	I+4,I+4	I+4,I+4	I+4,I+4	I+4,I+4
Vertebrae	24	—	24	24	24
Head length	35.4 (42)	—	11.8 (39)	19.2 (40)	11.5 (41)
Body depth	31.8 (37)	—	11.0 (37)	17.0 (35)	10.0 (36)
Orbit diameter	4.2 (05)	—	1.6 (05)	2.4 (05)	1.7 (06)
Snout length	8.3 (10)	—	3.0 (10)	4.8 (10)	2.8 (10)
Interorbital width	4.6 (05)	—	2.2 (07)	4.0 (08)	1.8 (06)
Jaw length	16.8 (20)	—	5.5 (18)	9.0 (19)	4.7 (17)
Predorsal fin length	23.4 (28)	—	8.3 (28)	13.5 (28)	7.8 (28)
Pectoral fin length*	39.5 (47)	—	13.3 (44)	22.4 (46)	12.0 (43)
Pelvic fin length	23.5 (28)	—	8.8 (30)	14.8 (30)	8.0 (29)

* from base of lower ray to tip of fin

TABLE 3. *Frequency distributions of number of dorsal fin rays in species of the subfamily Synanceiinae.*

	Spines							Soft rays										Total dorsal rays							
	11	12	13	14	15	16	17	3½ –4	4½ –5	5½ –6	6½ –7	7½ –8	8½ –9	9½ –10	10½ –11	11½ –12	12½ –13	13½ –14	18½ –19	19½ –20	20½ –21	21½ –22	22½ –23	23½ –24	24½ –25	25½ –26
S. alula	—	—	5	—	—	—	—	—	—	3	2	—	—	—	—	—	—	—	3	2	—	—	—	—	—	—
S. nana	—	—	—	8	1	—	—	—	9	—	—	—	—	—	—	—	—	—	8	1	—	—	—	—	—	—
S. horrida	—	—	20	1	—	—	—	—	—	—	21	—	—	—	—	—	—	—	—	20	1	—	—	—	—	—
S. platyrhynchus	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
S. verrucosa	—	1	19	2	—	—	—	—	—	2	18	2	—	—	—	—	—	—	3	16	3	—	—	—	—	—
E. erosa	—	—	—	16	—	—	—	—	—	1	15	—	—	—	—	—	—	—	—	1	15	—	—	—	—	—
D. daruma	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—
L. asteroblepa	—	—	—	—	—	4	—	—	4	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—
P. melanostigma	—	—	—	—	—	5	2	4	1	2	—	—	—	—	—	—	—	—	—	2	3	2	—	—	—	—
T. uranoscopus	1	7	1	—	—	—	—	—	—	—	—	—	—	—	—	6	3	1	—	—	—	—	—	7	2	1

TABLE 4. *Frequency distributions of number of anal fin rays in species of the subfamily Synanceiinae.*

	Spines			Soft rays									Total anal rays								
	2	3	4	4½ –5	5½ –6	6½ –7	7½ –8	8½ –9	9½ –10	10½ –11	11½ –12	12½ –13	13½ –14	6½ –7	7½ –8	8½ –9	9½ –10	10½ –11	11½ –12	12½ –13	13½ –14	14½ –15	15½ –16
S. alula	—	4	1	3	2	—	—	—	—	—	—	—	—	—	2	3	—	—	—	—	—	—	—
S. nana	—	8	—	1	7	—	—	—	—	—	—	—	—	1	8	—	—	—	—	—	—	—	—
S. horrida	2	17	—	—	19	—	—	—	—	—	—	—	—	—	2	17	—	—	—	—	—	—	—
S. platyrhynchus	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
S. verrucosa	—	22	—	—	21	1	—	—	—	—	—	—	—	—	—	21	1	—	—	—	—	—	—
E. erosa	—	16	—	—	15	1	—	—	—	—	—	—	—	—	—	15	1	—	—	—	—	—	—
D. daruma	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
L. asteroblepa	—	1	3	3	1	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—
P. melanostigma	—	7	—	—	—	5	2	—	—	—	—	—	—	—	—	—	5	2	—	—	—	—	—
T. uranoscopus	10	—	—	—	—	—	—	—	—	—	1	8	1	—	—	—	—	—	—	—	1	8	1

Comparisons. *Synanceia alula* resembles *S. horrida* in many respects, particularly by having a deep pit below the eye, but *S. alula* differs from *S. horrida* and all other species of the genus in having a very low pectoral ray count (11 versus 14 to 19). Other differences are given in the key or may be found by comparing 'Distinguishing features' sections.

Distribution. *Synanceia alula* is known only from the type specimens from the Solomon Islands in the western Pacific Ocean and from the Nicobar Islands in the northern Indian Ocean. The specimen figured by Keegan *et al.* (1964) also was from the Solomon Islands.

Name. The specific name '*alula*' (al'-ū-la), meaning little wing, is a Latin feminine noun, the diminutive of *ala* (wing), alluding to the very low pectoral ray count in this species.

Synanceia horrida (Linnaeus).

(Figures 5–6; tables 3–5.)

(A partial synonymy pertinent to the scope of the study.)

Scorpaena horrida Linnaeus, 1766, p. 453 (original description; type locality East Indies).

Scorpaena "alepidota" Bloch, 1787, pp. 106–108, pl. 183 ([see 'Remarks' below]).

Synanceia horrida, Bloch and Schneider, 1801, pp. xxxvii, 194, 573 (misspelled genus as *Synanceja* on p. 194, corrected on p. 573; brief description and synonymy); Cuvier *in* Cuvier and Valenciennes, 1829, pp. 440–446 (lengthy description; review of earlier literature); Bleeker, 1849, pp. 4, 9 (synonymy; brief description; range); 1852a, pp. 230, 237, 242 (compiled range); 1874, pp. 4, 11–13, fig. 1 on pl. 1 (synonymy; description; distribution); 1879, fig. 7 on pl. CCCCXVII (figure from Bleeker, 1874); Herre, 1951, pp. 479–480 (synonymy; description; Philippines); de Beaufort *in* Weber and de Beaufort, 1962, pp. 95–97 (synonymy; description; distribution).

Synanceia grossa Gray, 1830, pl. 97 (plate only, plus caption; type locality Singapore).

Synanceia trachynis Richardson, 1842, pp. 385–389 (original description; type locality Port Essington, Northern Territory, Australia).

Synancidium horridum, Günther, 1860, pp. 144–146 (brief synonymy; description of skeleton; BMNH specimens); Kner, 1865, p. 119 (description; Java); Day, 1875, p. 162, fig. 3 on pl. XXXIX (synonymy; description); Fowler, 1928, pp. 297–298 (compiled).

Scorpaena monstrosa Gray, 1854, p. 117 (after Gronovius and '*horrida*' of Linnaeus).

Synanceja horrida, McCulloch, 1929, p. 392 (synonymy; Australia); Whitley, 1930, pp. 24–25 (synonymy; comparisons with *S. trachynis*).

Synanceja trachynis, Whitley, 1930, pp. 25–26 (synonymy; Australian records; venom); 1932a, pp. 306–309, figs. 1–2 on pl. 4 (description; fresh coloration; Australia); 1960, pp. 1–6, 4 figs. (semi-popular account; habitat, coloration, venom); Munro, 1967, p. 540 (description; New Guinea).

Remarks. References on venom and related subjects, as well as specimen figures, are given by Halstead (1970). Some Australian workers continue to recognize *S. trachynis* as a species distinct from *S. horrida*; we have not made an exhaustive study but our specimens seem to indicate that the two names are synonyms.

Scorpaena alepidota of Bloch (1787) originated through an inadvertent

error. As evidenced by style in Bloch's work, a heading "*Scorpaena horrida*" before the words *Scorpaena alepidota* was omitted, giving the incorrect impression that '*alepidota*' was proposed as the scientific name. The plate was correctly labeled '*horrida*.' The name '*alepidota*' has no separate status nomenclaturally.

Material examined. (No counts were made on specimens which have standard length omitted.)

Singapore

SU 30873 (5 specimens, 67.8–134 mm. S.L.), Herre 1934 Pacific Expedition, A. W. Herre, 15 March 1934. SU 36001 (1, 151), Singapore market, A. W. Herre, February 1937. SU 32128 (1, 159), 8 February 1899.

Thailand

USNM 209422 (2, 147–190), Paton Bay, Patong Phuket, International Indian Ocean Expedition, *Anton Bruun* Cruise No. 1, 22 April 1963. CAS 15073 (1, 102), Rayong Province, SE. of Ban Phe Fisheries Station, 12°35′40″N., 101° 25′43″E., Fehlmann and assistants, 28 April 1960. Plus ANSP 89676 (1).

Philippines

CAS 15074 (1, 136), Calaogao, Cauayan, Negros Island, collected among coral stones at night, 10°N., 122°30′E., Q. Akala, 18 May 1960. SU 34132 (1, 196), Sitankai, Sulu Island, Oriental Expedition 1936–37, A. W. Herre, 9 January 1937. SU 29780 (1, 158), Manila Bay, A. W. Herre, December 1933. SU 28363 (1, 95.0), Atimonan, Tayabas, Herre 1931 Philippine Expedition, A. W. Herre, 1931. SU 39137 (1, 111), Ragay Gulf, Luzon, A. W. Herre, 1940. Plus SU 28365 (2).

Batavia

ANSP 90442 (1), Baai.

New Guinea

SU 26744 (1, 160), Waigiu Island (= Waigeo Island), A. W. Herre, 7 June 1929.

Australia

USNM 174014 (5, 57.5–73.7), Northern Territory, reefs and tide pools off south entrance to lagoon, Groote Eylandt, Arnhemland Expedition, R. R. Miller and party, 19–25 March 1948.

Distinguishing features. Dorsal XIII–XIV (usually XIII) + 6½; anal II–III (usually III) +5½; pectoral 15–17, usually 16; pelvic I + 4–5, usually 5; all fin rays usually branched; head large, depressed, with deep pits; eyes elevated, with bony crest above posterior corner of orbit, joined between orbits; occiput depressed, forming a deep saddle behind orbits; a deep, mostly round pit below eye; deep pit below parietal and nuchal spines. Body covered with thick skin and warts.

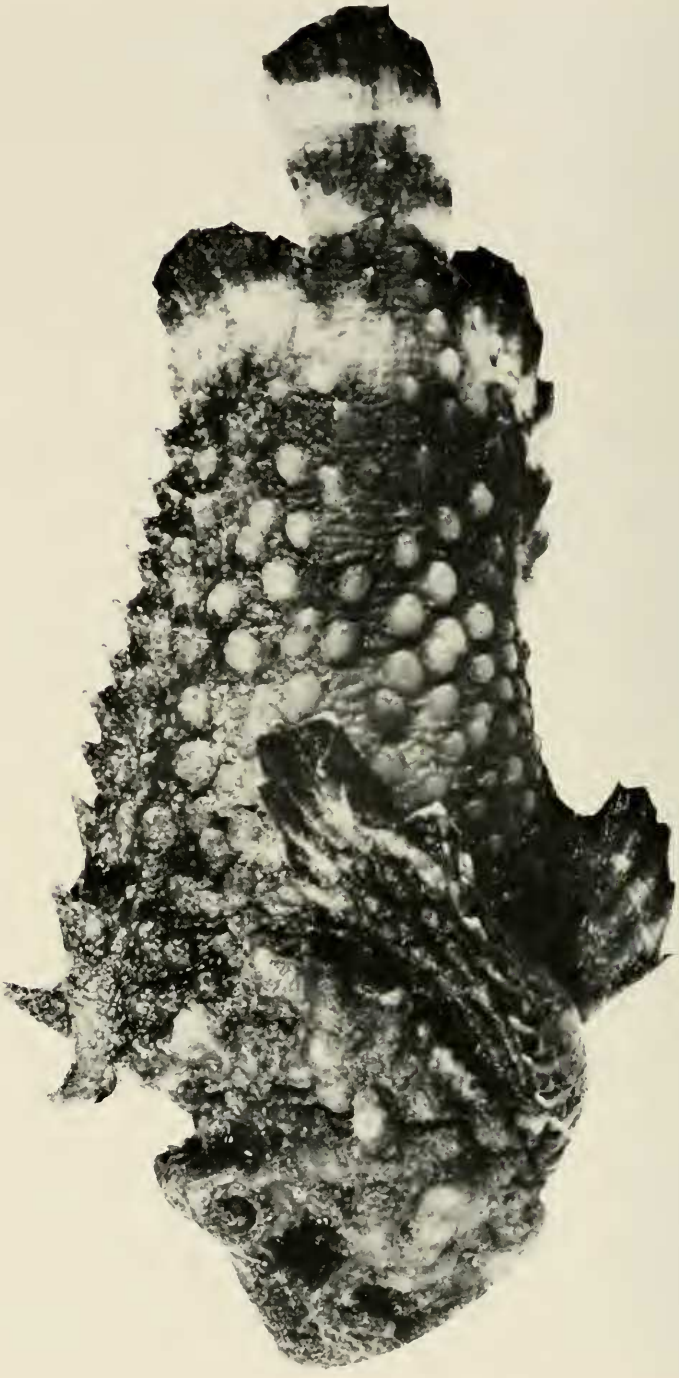

FIGURE 5. *Synanceia horrida*, USNM 174014, sub-adult, 67 mm. S.L., Australia.

Figure 6. *Synanceia horrida*, CAS 15074, head of an adult, 142 mm. S.L., Philippines.

Description. Dorsal fin with 13 spines, occasionally 14; spines nearly same length, second to fourth longest, covered by thick skin. Dorsal soft rays 6½, branched distally. Anal fin with 3 spines (2 spines in 2 of 19 specimens) and 5½ soft rays, spines progressing in length from first to third, soft rays branched distally. Pectoral fin rays 15–17, usually 16, all rays branched at tips. Pelvic fin with 1 spine and 4 or 5, usually 5, soft rays [one specimen (SU 28363) abnormally with I + 3 on right and I + 5 on left]. Gill rakers rudimentary, total 13–15 in larger specimens, difficult to distinguish on upper arch in our specimens below 75 mm. S.L., larger specimens with 5–6 on upper arch, all

Table 5. *Frequency distributions of pectoral rays and pelvic soft rays in species of the subfamily Synanceiinae.*

	Pectoral rays (left side)									Pelvic soft rays (left side)		
	11	12	13	14	15	16	17	18	19	3	4	5
S. alula	5	—	—	—	—	—	—	—	—	1	5	—
S. nana	—	—	—	8	1*	—	—	—	—	—	—	9
S. horrida	—	—	—	—	3	14	2	—	—	—	2	17
S. platyrhynchus	—	—	—	—	—	—	1	—	—	—	—	1
S. verrucosa[1]	—	—	—	—	—	—	—	19	3	—	1**	21
E. erosa	—	—	—	1	14	1	—	—	—	—	16	—
D. daruma	—	1	—	—	—	—	—	—	—	—	1	—
L. asteroblepa	—	—	—	3†	1	—	—	—	—	—	4	—
P. melanostigma	—	—	—	3	5	—	—	—	—	7	—	—
T. uranoscopus	—	—	—	6	4	—	—	—	—	—	—	10

* 16 on right

** 5 on right

† one with 13 on right

[1] left and right pectoral ray counts for 24 additional specimens: 17+18 (1 specimen), 18+18 (22), 19+19 (1).

sizes with 8–9 on lower arch. Lateral line pores usually 10–12, difficult to distinguish from warts. Vertebrae 24.

Body shape and coloration as in figure 5. Head (fig. 6) broad, depressed; eyes elevated slightly, accentuated by large, mostly circular deep pit below eyes and large crests above eyes. Occipital area deep, forming saddle between eyes and beginning of dorsal fin; this area smooth, without warts. Deep pit also present behind eye below parietal and nuchal spines. Preorbital bone prominent, with broad spinous point directed downwards, with lateral ridges pointing anteriorly. Suborbital ridge with one large lump in middle. Supplemental preopercular spine usually present as a lump, first three preopercular spines usually present, first and second the largest. Other head spines indistinct or developed as lumps or absent. Small teeth on jaws and vomer, none on palatines.

Coloration of a small specimen as in figure 5. In preservative mostly brown; fins tend to be darker distally, except for spinous dorsal fin; caudal darkest at base, in middle, and distally; remaining areas of caudal fin streaked with white.

Comparisons. *Synanceia horrida* is most like *S. alula* in having a large pit below the eyes, but *S. horrida* is easily separated from *S. alula* by having more pectoral rays (15–17 versus 11), among other features. From the widespread *S. verrucosa*, *S. horrida* can be distinguished by having a large circular pit below the eye and high crests above the eyes which are joined, leaving no pit between the eyes. Other differences are given in the key and other 'Comparisons' sections.

Distribution. *Synanceia horrida* has a fairly wide range, occurring from

India eastwards to Java, New Guinea, Australia, the Philippines, and China. Unlike *S. verrucosa* it is apparently absent from the central Pacific and from western India to the Red Sea and Africa. It appears to be a continental and 'large island' species living on sandy or muddy bottom among rocks. (A record of this species from Saint Helena in the Atlantic (Günther, 1860, p. 145) was presumed (Eschmeyer, 1971, p. 503) to be based on incorrect locality information accompanying the specimen.)

Synanceia platyrhynchus Bleeker.

(Figure 7; tables 3–5.)

Synanceia platyrhynchus Bleeker, 1874, pp. 4, 11, 14–15, fig. 2 on pl. 1 (original description; type locality Amboina); 1879, fig. 2 on pl. CCCXVI (figure of type from Bleeker, 1874); de Beaufort *in* Weber and de Beaufort, 1962, p. 99 (examined type and one additional specimen with no locality data; thought to be a hybrid between *S. verrucosa* and *S. horrida*).

Synanceja (*Nofua*) *platyrhynchus*, Whitley, 1930, p. 24 (as type of a new subgenus).

Material examined. RMNH 5898 (1, 129 mm. S.L., 164 or 165 mm. T.L., holotype of *S. platyrhynchus*), Amboina. We could not locate the second specimen mentioned by de Beaufort *in* Weber and de Beaufort (1962, p. 99).

Remarks. De Beaufort gave the length of the two specimens he examined as 153 and 220 mm. and stated that one of them was the type. One of these measurements must be in error as the type in Leiden is 165 mm. T.L., the same length Bleeker gave in the original description.

The type specimen appears to us to be referable to *S. horrida*, but it seems to be abnormal in that the crests above the eyes are more poorly developed and are not joined between the eyes. This leaves a depression between the eyes which approaches somewhat the condition in *S. verrucosa*, although in *S. verrucosa* the pit is broader and the eyes farther apart. The type of *S. platyrhynchus* is very similar to *S. alula* with regard to head shape and location of crests and pits, but *S. alula* has far fewer pectoral rays (11 versus 17). We have kept *S. platyrhynchus* as a separate entry in this paper to draw attention to it in hopes that additional specimens may be found if it is in fact a species distinct from *S. horrida*.

Counting by the methods used in this paper, the type specimen has dorsal rays XIII + 6½, anal rays III + 5½, and pelvic rays I + 5. De Beaufort (*in* Weber and de Beaufort, 1962, p. 99) discusses the type specimen in more detail. A photograph of the type as it appears now is reproduced as figure 7.

Synanceia verrucosa Bloch and Schneider.

(Figure 8; tables 3–5.)

(A partial synonymy pertinent to the scope of the study.)

Synanceia verrucosa Bloch and Schneider, 1801, pp. XXXVII, 195, pl. 45 (original description; type locality India; spelling of genus on p. 194 corrected to *Synanceia* in Cor-

Figure 7. *Synanceia platyrhynchus*, RMNH 5898, holotype, 129 mm. S.L., Amboina.

rigenda, p. 573); Günther, 1860, p. 146 (synonymy; brief description; BMNH specimens); Bleeker, 1874, pp. 4, 11, 15–17 (synonymy; description; range); Day, 1875, pp. 162–163, fig. 4 on pl. XXXIX (synonymy; description; range); Bleeker, 1879, fig. 5 on pl. CCCCXVII (figure only); Herre, 1951, pp. 479–482 (synonymy; description; Philippines); de Beaufort *in* Weber and de Beaufort, 1962, pp. 95, 97–99 (synonymy; description; distribution).

Scorpaena bicirrata Lacépède, 1801, pp. 333, 349–350 (original description, from Commerson).

Scorpaena brachion Lacépède, 1801, pp. 333, 351–352, pl. 12 opposite p. 360 (original description, based on drawing from Commerson; no type locality).

Scorpaena Bicapillata Shaw, 1803, p. 273, pl. 40 (for Lacépède's *Scorpaena bicirrata*; description from Lacépède).

Scorpaena Brachiata Shaw, 1803, p. 274 (for Lacépède's *Scorpaena brachion*).

Synanceia brachio Cuvier *in* Cuvier and Valenciennes, 1829, pp. 447–454 (new spelling for *S. brachion* Lacépède; synonymy; long description; review of earlier literature); Bleeker, 1849, pp. 4, 9–10 (synonymy; description; range); 1852a, pp. 233, 236, 240 (listed; Ternate, Banda, Ceram, and Waigioe).

Synanceia bicapillata, Cuvier *in* Cuvier and Valenciennes, 1829, pp. 454–456 (synonymy; description; discussion); Bleeker, 1849, p. 4 (compiled range); 1852a, pp. 230, 242 (listed; Molucca).

Synanceia sanguinolenta Cuvier *in* Cuvier and Valenciennes, 1829, p. 447, footnote (original description from Ehrenberg MS and figure; no locality).

Synanceja verrucosa, Fowler, 1928, p. 299 (synonymy; remarks; range); McCulloch, 1929, 392–393 (synonymy; range).

Synanceichthys verrucosus, Bleeker, 1863, p. 234 (listed; Ternate); Whitley, 1932a, pp. 309–310 (rare on Great Barrier Reef; AMS specimens from other localities); Munro, 1967, p. 540 (description; New Guinea).

Emmydrichthys vulcanus Jordan and Rutter *in* Jordan, 1896, pp. 221–223, 562, pl. 26 (original description; type of new genus; type locality Society Islands).

Synanceia thersites Seale, 1901, pp. 121–122 (original description; type locality Marianas Islands [holotype BPBM 256, not found; paratype ANSP 91726]).

Deleastes daector Seale, 1906, pp. 80–81, fig. 22 (original description; type locality Tahiti; holotype BPBM 1360 [not found]).

Remarks. All the nominal species listed above have been recognized as synonyms of *S. verrucosa* by previous workers. *Emmydrichthys vulcanus* was based on a specimen with an abnormal dorsal fin. In the original description of *Deleastes daector*, Seale reported it differed from *Synanceia* by having shorter pelvic fins, pelvic fins located more posteriorly, and a smoother skin. The location and apparent size of the pelvic fins depend in part on the position of the hyoid arch on preservation, and we find that either of two conditions is common: the depth between the rear of the head and the pelvic fin will be shallow when the hyoid arch is not depressed or will be deep when the arch is depressed downward. The presence of warts was found to be somewhat variable. A more thorough study should be made.

Material examined. (No counts were made, except of pectoral rays, on specimens which have standard length omitted.)

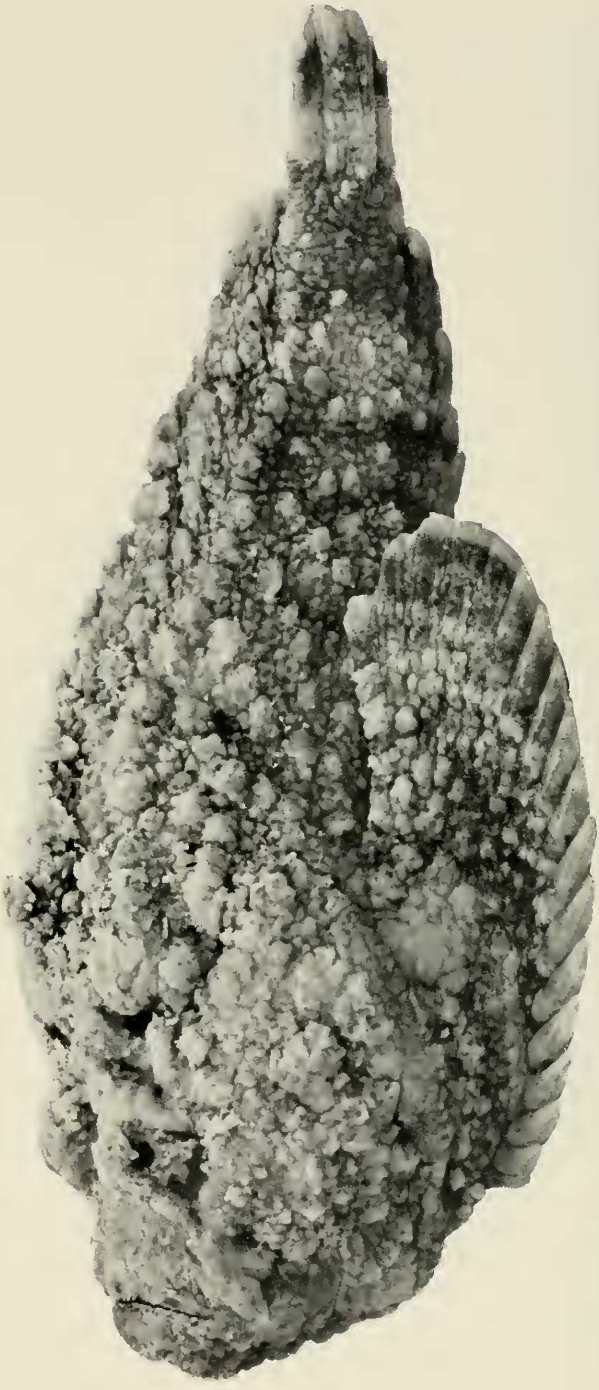

Figure 8. *Synanceia verrucosa*, CAS 13760, adult, 129 mm. S.L., Australia. (Specimen tilted slightly on left side.)

Western Indian Ocean

CAS 14943 (1 specimen, 123 mm. S.L.), Kenya, Andromache Reef just south of entrance to Port Kilindini of Mombasa Harbor, 4°05′05″S., 39°40′39″E., over flat reef with dead coral and sand, International Indian Ocean Expedition, *Anton Bruun* Cruise No. 9, sta. HA-1, 15 November 1964; SU 37205 (1, 154), southern Andaman Islands, south of Corbyn's Cove, Port Blair, under a coral stone in low water, D. D. Mukerji, 16 December 1933; Plus ANSP 107718 (1) and ANSP 107702 (1), Sechelles; USNM 19981 (1), Mauritius.

Ceylon

CAS 14969 (3), Trincomalee, outside harbor at coral cave, inside base of Royal Navy of Ceylon, depth to 1.5 meters, W. Smith-Vaniz, 27 June 1969.

Okinawa

USNM 71553 (1).

Philippines

SU 28362 (2, 121–187), Sitankai, Sulu Province, Herre Philippine Expedition, A. W. Herre, 12 August 1931. SU 28364 (1, 51.3), Dumaguete, Herre Philippine Expedition, A. W. Herre, 11 June 1931. Plus SU 34135 (1).

Micronesia

Palau Islands: CAS 14957 (1, 97.5), Auluptagel Island, Crocodile Cove, 7°17′ N., 134°29′E., Brittan *et al.*, 29 July 1956. CAS 14959 (1, 106), Angaur Island in Garangaoi Cove, south of Cape Nagaramudel, 6°53′50″N., 134°7′49″E., DeWitt and party, 22 October 1957. CAS 14956 (2, 119–133), Ngadarak Reef SW. of Auluptagel Island, 7°17′48″N., 134°28′37″E., Rikrik, 8 July 1956. Plus CAS 14953 (1), CAS 14954 (1), CAS 14958 (1), CAS 14960 (1), and CAS 14961 (1). *Mariana Islands*: CAS 14963 (1, 39.1), Guam, ca. ½ mile SW. of Agat village, sand flat off north side of Bangi point, 13°22′36″N., 144°38′53″E., Fehlmann, 12 October 1958. CAS 14965 (3, 54.2–121), Guam reef and sand flat north of Tringhera Beach in Agana Bay, 13°28′53″N., 144° 45′45″E., Fehlmann and Bronson, 7 April 1959. ANSP 91726 (1, 160, paratype of *S. thersites*), Guam, Agana, A. Seale, 12 July 1900. Plus CAS 14966 (2), CAS 14962 (1), and CAS 14964 (1). *Caroline Islands*: CAS 14947 (1, 126), Yap Island, inlet on east side of Yap Island, 9°29′48″N., 138°26′57″E., Bronson and Hermana, 27 December 1959. Plus CAS 14952 (3) and CAS 14948 (1).

Melanesia

Solomon Islands: CAS 15076 (1, 47.8), Bougainville, east side of Puk Puk Island, sea beach outside of Poison Lagoon, *Te Vega* Expedition, Cruise No. 6,

Sta. 243, William P. Davis, 9 March 1965. SU 6034 (1, 154), Sikiana Island, Stewart group, Crocker Expedition, 16 May 1933.

Polynesia

Samoa: CAS 2228 (1, 115), A. Seale, 25 June 1929. CAS 2225 (2, 94.3–168), Pago Pago, A. Seale, May 1929. Plus SU 9041 (3) and CAS 14967 (1). *Fiji*: SU 21021 (1). *Tonga Islands*: CAS 14968 (1). *Society Islands*: SU 5357 (1, 187, holotype of *Emmydrichthys vulcanus*). CAS 14949 (1, 135), Tahiti, Tavavo, J. E. Randall, 21 April 1956. CAS 14955 (1, 47.4), Moorea, Faatoai village at entrance to Papetoai Bay, J. E. Randall and party, 30 June 1956. Plus CAS 14950 (3) and CAS 14983 (1). *Tuamotu Islands*: CAS 14946 (2) and CAS 14945 (1).

New Caledonia

USNM 208132 (1), Noumea.

New Guinea

USNM 30516 (1).

Australia

CAS 13760 (1, 129), Capricorn Islands, One Tree Island, west side, reef flat, caught under stone on reef crest, F. McMichael, 20 November 1969. Plus CAS 14944 (1), Fairfax Island.

Red Sea

HUJ uncataloged (101 mm. S.L.).

Distinguishing features. Dorsal XII–XIV, usually XIII + 5½–7½, usually 6½; anal III + 5½–6½, usually 5½; pectoral 17–19, usually 18; pelvic I + 5; all soft rays usually branched, covered with thick skin; head depressed; eyes only slightly elevated, far apart, and with a deep depression between; occipital area elevated, bordered laterally by a pit lying behind each eye; small pit below and before eyes, pit smaller than orbit. Body covered with thick skin and warts.

Description. Dorsal fin normally with 13 spines; spines nearly same length, about third through fifth the longest, covered by thick skin. Dorsal soft rays 5½–7½, usually 6½, branched distally. Anal fin with 3 spines and 5½ (rarely 6½) soft rays, soft rays branched distally, spines progressing in length from first to third. Pectoral fin rays 18–19, usually 18; all rays branched distally but dissection may be necessary to discern in lower fleshy pectoral rays, rays unbranched in very small specimens. Pelvic fin with 1 spine and 5, or rarely 4, soft rays. Gill rakers rudimentary, total 8–11, 1–4 on

upper arch, 6–8 on lower arch. Lateral line difficult to distinguish from warts, usually 8–10 pores present. Vertebrae 24.

Body shape and coloration as in figure 8. Head large, broad, and depressed; eyes very slightly elevated, far apart, and with a deep pit between them; occipital area elevated, without a pit; a pit present behind each eye lateral to occiput, deepest below parietal and nuchal spinous ridge; a small, more or less U-shaped pit, less than orbit diameter, below and in front of eyes. Preorbital bone covered by thick skin, usually with two diverging spines over maxillary. Suborbital ridge with one large lump in middle under eye. Supplemental preopercular spine usually absent, first and second preopercular spines large, third sometimes present, fourth and fifth absent. Other head spines indistinct, or developed as lumps or ridges, or absent. Small teeth on jaws, none on vomer or palatine.

Coloration variable. In preservative mostly brown (fig. 8). Pectoral, pelvic, and caudal fins tipped with white. Caudal fin with a subterminal dark band. Paler areas on body, usually well marked between soft dorsal and anal fin.

COMPARISONS. *Synanceia verrucosa* is most like *S. nana* in shape and location of pits on the head, but *S. verrucosa* is easily separated from *S. nana* by having more pectoral rays (18–19 versus 14). *Synanceia verrucosa* lacks vomerine teeth, while the other species of the genus have small teeth on the vomer. *Synanceia verrucosa* may be separated from the other species of the genus by the characters presented in the key.

DISTRIBUTION. *Synanceia verrucosa* is the most widespread stonefish and is known from throughout the Indo-West Pacific faunal region from the Red Sea, eastern Africa east to Tahiti, and from Australia north to Japan. It is found in shallow water among coral reefs and coral rubble.

Genus **Erosa** Swainson

Erosa SWAINSON, 1839, p. 61 (type-species *Synanceia erosa* Langsdorf, understood from text).

Bufichthys SWAINSON, 1839, p. 181 (type-species *S. erosa*, by monotypy [see 'Nomenclatural remarks']).

Synanchia, SWAINSON, 1839, p. 268, not pp. 61 or 280–281 (misidentification or misprint [see 'Nomenclatural remarks']).

Synanchia, BLEEKER, 1874, pp. 3–4 (as a genus for '*erosa*'; after Swainson, 1839, p. 268 [see 'Nomenclatural remarks']).

Erosa, JORDAN and STARKS, 1904, p. 156 (described as a "new genus" after Swainson; wrongly thought Swainson's name had no nomenclatural standing).

NOMENCLATURAL REMARKS. See 'Nomenclatural remarks' under the genus *Synanceia*.

GENERIC DIAGNOSIS. See 'Distinguishing features' under the species account.

Erosa erosa (Langsdorf).
(Figure 9; tables 3–5.)

Synanceia erosa Langsdorf *in* Cuvier and Valenciennes, 1829, pp. 459–460 (original description; type locality Japan); Cuvier, 1837, p. vii, fig. 3 on Ichthyology pl. 21 (color plate); Temminck and Schlegel, 1843, p. 45, fig. 1 on pl. xvii (brief description; Japan); Boeseman, 1947, pp. 54–55 (Burger and Von Siebold specimens from Japan; equals *Erosa erosa*).

Synanchia erosa, Swainson, 1839, p. 268 (name only; *Synanchia* in error for *Bufichthys* [see 'Nomenclatural remarks' under genus *Synanceia*]).

Synancidium erosum, Günther, 1860, p. 146 (brief description; BMNH specimens); Steindachner and Döderlein, 1884, p. 199 (short description; Tokyo and Kagoshima); Nyström, 1887, p. 19 (description; one specimen from Japan); Ishikawa and Matsuüra, 1897, p. 49 (listed; Kagoshima, Japan).

Erosa erosa, Jordan and Starks, 1904, pp. 156–158, fig. 16 (synonymy; description; variation in coloration; Japan); Franz, 1910, p. 74 (specimens from Japan); Jordan and Thompson, 1914, p. 276, fig. 46 (listed; Japan; figure from Jordan and Starks, 1904); McCulloch, 1921, pp. 177–178 (*E. iridea* a synonym; description; figure of holotype of *E. iridea*); Jordan and Hubbs, 1925, p. 275 (specimens from Japan); McCulloch, 1929, p. 392 (listed; *E. iridea* a synonym); Schmidt, 1931, p. 111 (specimen from Japan); Fowler, 1938b, p. 199 (listed from Malaya); Matsubara, 1943, pp. 422–424 (synonymy; description; internal features; specimens from Japan).

Erosa fratrum Ogilby, 1910a, p. 32 (original description; type locality Moreton Bay, coast of southern Queensland, Australia); McCulloch, 1929, p. 392 (listed; Australia); Whitley, 1964, p. 57 (listed; Australia).

Erosa iridea Ogilby, 1910b, p. 113 (original description; type locality 19 miles N., 30°W., from Double Island Point, in 33 fathoms, coast of southern Queensland, Australia).

Material examined. (Counts were not taken on specimens with standard length omitted and locality information abbreviated.)

Japan

SU 7385 (1, 98.3), Misaki, Jordan and Snyder. SU 7389 (1, 85.5), Nagasaki, Hizen, Jordan and Snyder. SU 7197 (3, 77.7–109), Odowara. FSUT 7550 (1, 94.7), Wakayama. FSUT 32013 (1, 111), Nagasaki. FSUT 32263 (1, 48.4), Nagasaki. FSUT 34630 (1, 131), Kochi. FSUT 34633 (1, 69.0), Kochi. Plus USNM 51342 (1), USNM 59714 (1), USNM 75919 (2), and USNM 57650 (1).

South China Sea

CAS 14800 (1, 91.0), 20°04′N., 111°58′E., R. L. Bolin, 20 July 1958. CAS 14797 (1, 85.2), 20°02′30″N., 113°32′E., F. D. Ommanney, 25 June 1958. CAS 14799 (1, 111), Formosa Strait, just south of Formosa Banks to Pescadores Island, about 30–50 meters, trawl, F. B. Steiner, 5 May 1972.

Philippines

USNM 168213 (1), southern Luzon.

Amboina

ZMK uncatalogued (1, 30.3), Bugten, in about 50 fathoms, T. Mortensen, 21 February 1922.

Australia

QMB 13/1571 (about 97.0, ?holotype of *Erosa fratrum*), Moreton Bay, Queensland. AMS E2943 (1, 63.0, ?holotype of *Erosa iridea*), 19 miles N., 30° W. from Double Island Point, in 33 fathoms, Queensland.

Distinguishing features. Dorsal XIV + 5½–6½, usually 6½; anal III + 5½–6½, usually 5½; pectoral 14–16, usually 15; pelvic I + 4; all fin rays usually branched; no palatine teeth; head very large, globular; mouth terminal, only slightly oblique; eyes large and on lateral surface of head; a strong bony ridge connects orbits, followed on occiput with a deep pit; warts behind head, not well marked on body posteriorly.

Description. Dorsal fin with 14 spines, all about same length. Dorsal soft rays 5½ or 6½, usually 6½ (without close examination would probably count 7 rather than 6½ soft rays). Anal fin with 3 spines, first short, second twice first, third longest. Anal soft rays 5½–6½, usually 5½ (appearing as 6). Pectoral fin short, 14–16 (usually 15) branched rays. Pelvic fin with 1 spine and 4 soft rays. Gill rakers rudimentary, total 10–13, 3–4 on upper arch and 7–9 on lower arch. Lateral line tubes 10–11, including one on caudal fin. Some warts on body, most conspicuous behind head. Vertebrae usually 25 (24–26).

Body shape and coloration as in figure 9. Head round; mouth terminal, slightly oblique; eyes not elevated, on side of head, pointing outwards. A strong ridge connects the orbits posteriorly; ridge followed by deep square to rectangular occipital pit; pit also present before ridge connecting orbits but occupied by ascending arms of premaxillaries. No pit below eyes or below parietal and nuchal spines. Preorbital bone with 2 broad spines over maxillary. Suborbital ridge without distinct spines, raised in middle. Five blunt preopercular spines present, plus 2 lumps on dentary and 3 spines near bases of upper preopercular spines. Large cleithral spine, two blunt opercular spines. Other spines indistinct, developed as lumps. Small teeth on jaws and vomer, none on palatines.

In preservative (fig. 9) body brown or black on a pallid background; area behind head and below soft dorsal fin darkest. Pectoral fin streaked and mottled with brown or black, most lines enclosing circles, a white patch at midheight of upper pectoral rays; anal fin mostly pallid with streaks and circular rings of dusky pigment; caudal fin pallid, crossed by about 6 vertical narrow dark bands (or double bands). Body most noticeably pallid at bases of middle dorsal spines and below middle of spinous dorsal fin.

Comparisons. The genus *Erosa* is most like *Dampierosa* in body shape and shares with it (but not with *Synanceia*) the following features: eyes lateral, mouth only slightly oblique, head globular and not depressed. *Erosa* differs

FIGURE 9. *Erosa erosa*, CAS 14799, adult, 111 mm. S.L., Formosa Strait.

from *Dampierosa* in having a lower soft dorsal fin ray count (5½–6½ versus 9½), 14 rather than 12 dorsal spines, and 3 rather than 2 anal spines.

DISTRIBUTION. *Erosa erosa* occurs from Japan south to Australia; specific localities represented by our material and records in the literature are Japan, the South China Sea area, the Philippine Islands, Amboina, and eastern Australia.

Genus **Dampierosa** Whitley

Dampierosa WHITLEY, 1932b, p. 346 (type-species *Dampierosa daruma* by original designation; monotypic).

GENERIC DIAGNOSIS. See 'Distinguishing features' under the species account below.

Dampierosa daruma Whitley.

(Figure 10; tables 3–5.)

Dampierosa daruma WHITLEY, 1932b, pp. 346–347, figs. 2–3 on pl. XXXVIII (original description; type locality northwestern Australia, dredged off Broome, 1931, collector R. Bourne; holotype AMS IA5116); 1964, p. 57 (listed).

Erosa daruma, MEES, 1960, p. 19 (one specimen from Roeburne, Western Australia; dorsal XIII + 8; anal I + 7 (or III + 5); pectoral 12; placed in genus *Erosa*).

MATERIAL EXAMINED. AMS IA5116 (97.2 mm. S.L., about 119 mm. T.L., holotype), locality as given above. Plus one specimen briefly examined, C.S.I.R.O. Marine Laboratory, Munroe Collection C2766 (53.0 mm. S.L.), from Exmouth Gulf.

DISTINGUISHING FEATURES. Dorsal XII + 9½ (?XIII + 8½); anal II + 6½; pectoral 12; pelvic I + 4; no palatine teeth; head large, globular; mouth terminal, slightly oblique; strong bony ridge connects orbits, followed on occiput by a deep pit; body with warts.

DESCRIPTION. (Based only on the holotype. A more complete description is given by Whitley.) Dorsal fin with 12 spines and 9½ soft rays (first soft ray segmented slightly, counted by Whitley (1932b) as a spine). Anal fin with 2 spines and 6½ soft rays. Dorsal and anal spines fairly weak. Pectoral fin short, with 12 rays. Pelvic fin with 1 spine and 4 soft rays. Gill rakers as given by Whitley: 7 or 8 short, rounded, thick gill rakers on first arch. Lateral line tubes 13. Body covered with warts. Vertebral count not available.

Body shape and coloration as in figure 10. Head globular; mouth terminal, slightly oblique; eyes not elevated, on side of head, directed outwards. A strong ridge connects the orbits; ridge followed by deep occipital pit. No pit below eyes or below parietal and nuchal spines. Preorbital bone with 2 large lumps over maxillary. Suborbital ridge without spines. Preopercle spines prominent. (No information available on other spines.) Small teeth on jaws and vomer, none on palatines.

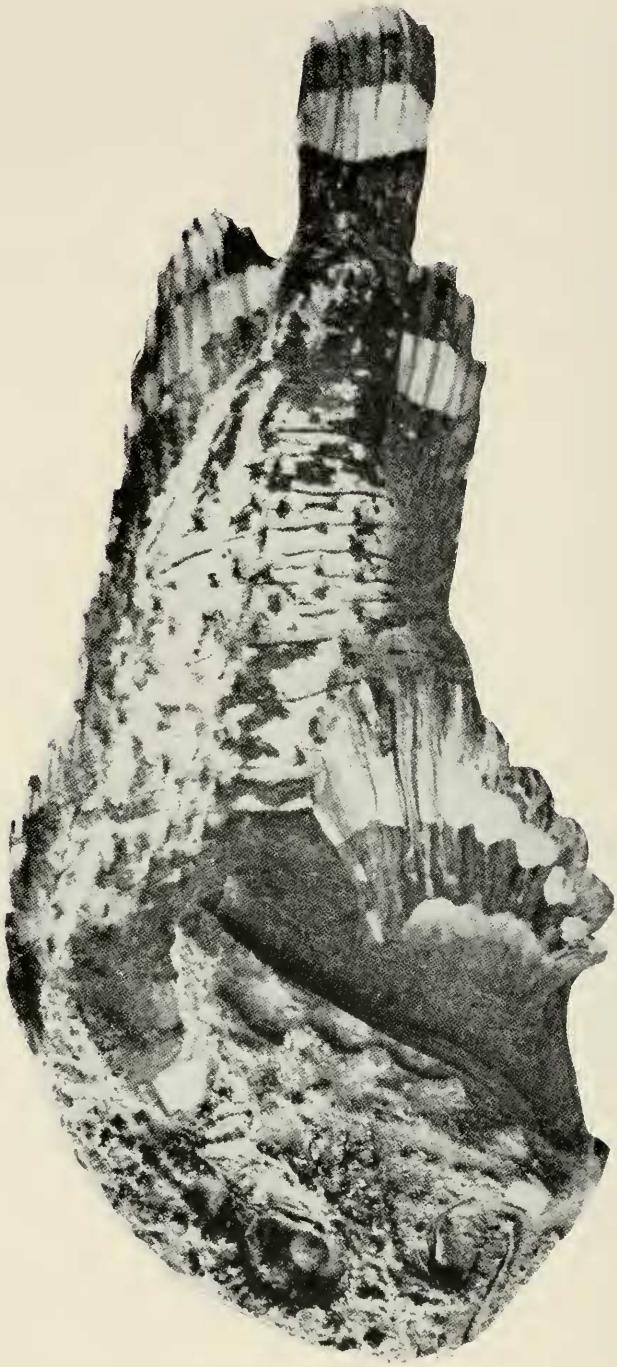

FIGURE 10. *Dampierosa daruma*, holotype, AMS IA5116, 97 mm. S.L., Australia; figure from Whitley, 1932b.

Coloration as given by Whitley (1932b, p. 347) is as follows:

> "General colour in alcohol dark purplish-brown, irregular in tone and broken up by the lighter papillae and raised cephalic surfaces. Interorbital and pterotic regions white. Light brown mottling on lower surface of head and on parts of the body below the spinous and soft dorsal fins. Dorsal dark brown anteriorly, but mottled yellowish on the middle and posterior spines. Soft dorsal dark brownish with a narrow margin of yellow and a broad oblique median band of yellow. Anal similar to soft dorsal. Pectoral dark brownish with a yellowish band partly encircling its base, a broader band crossing the rays to form large ocelli below and a distal margin of yellowish. Ventrals dark brown with two bands of yellowish and a similarly coloured spot on the proximal part of the last ray. Caudal dark brown, crossed by a broad median band of yellowish and with a broad margin of the same colour."

COMPARISONS. See 'Remarks' below.

DISTRIBUTION. *Dampierosa daruma* apparently is known only from three localities off northwestern Australia.

REMARKS. The holotype was briefly examined by the first author. We believe that additional study will show that *Dampierosa* should be regarded as a synonym of *Erosa*, even though the species differ substantially in counts of dorsal and anal fin rays. The head shape is nearly identical, sharing the presence of a strong ridge joining the orbits, with a small pit before, and a large occipital pit after this ridge. The eyes and mouth are similarly located in the single species in each genus. In most scorpaenid fishes fin ray counts are fairly stable for a given genus, but in the stonefishes the counts are variable in apparently closely related species, and, as discussed under the subfamily section, there appears to be a trend towards an increase of dorsal spines at the expense of the dorsal soft rays in species of this subfamily. The presence of 2 anal spines in *Dampierosa* and 3 (the usual condition in scorpaenids) in *Erosa* is not regarded as a major difference; in *Dampierosa* the third anal spine has become a segmented ray. Mees (1960, p. 19) gives anal rays as I + 7 or III + 5 for 1 specimen of *Dampierosa*. A clarification of the dorsal and anal fin ray counts in available specimens of *Dampierosa* is needed, and internal features of *Erosa* and *Dampierosa* should be compared.

Genus **Pseudosynanceia** Day

Pseudosynanceia DAY, 1875, p. 163 (type-species *Pseudosynanceia melanostigma* Day, by monotypy).

GENERIC DIAGNOSIS. See 'Distinguishing features' under the species account below.

Pseudosynanceia melanostigma Day.

(Figure 11; tables 3–5.)

Pseudosynanceia melanostigma DAY, 1875, p. 163, fig. 6 on pl. LV (original description; excellent figure of holotype; type locality Karachi, Pakistan; holotype ZSI 1761).

Leptosynanceia melanostigma, DAY, 1888, p. 788 (placed in genus *Leptosynanceia*); BLEGVAD and LØPPENTHIN, 1944, p. 193 (brief description; coloration; specimens from Iranian Gulf); KHALAF, 1961, p. 125 (description; counts as follows: dorsal XV–XVI + 5–6, anal III + 7, pectoral 14–15, ventral I + 2; wrongly states no lateral line; from Fao, Iraq).

MATERIAL EXAMINED.

PERSIAN GULF

USNM 196472 (1, 51.6), ESE. of Abu Ali, C. E. Dawson, sta. 13, 13 October 1956.

WEST PAKISTAN

USNM 199671 (1, 90), near Karachi, received from El Husseini, 24 January 1966. ZSI 1761 (1, 127, holotype of *Pseudosynanceia melanostigma*), Karachi. AMS B8183 (1, about 115), Karachi, purchased from Day in 1885 [This specimen listed as type in AMS records but it is not]. SU 62409 (1, 75.7), vicinity of Karachi, M.A. El Husseini, 1963.

INDIA

CAS 14801 (1, 77.8), western India, north side of Okha Point, tide pool, International Indian Ocean Expedition, *Anton Bruun* Cruise No. 1, 9 March 1963. USNM 209423 (1, 53.9), western India, 22°54′N., 68°36′E., in 15.5 meters, International Indian Ocean Expedition, *Anton Bruun* Cruise No. 4B, sta. 223A, 19 November 1963.

DISTINGUISHING FEATURES. Dorsal XV–XVII + 4–6, usually XVI + 4; anal III + 7–8; pectoral 14–15; pelvic I + 3; all soft rays including pectoral rays unbranched; head depressed; eyes on dorsal surface, pointing mostly upwards; mouth superior; no deep pits on head; body without prominent warts.

DESCRIPTION. Dorsal fin with 15–17 spines, all spines slender but with prominent venom glands, all about same length. Dorsal soft rays 4–6, last single. Anal fin with 3 spines of nearly same length. Anal soft rays 7–8, last single. Pectoral fin long, reaching to over anal fin spines, with 14–16 (usually 15) unbranched rays. Pelvic fin small, with 1 spine and 3 unbranched soft rays. Gill rakers rudimentary, total 7–10, with 1–3 on upper arch and 6–7 on lower arch. Lateral line not visible to unaided eye (with magnification a subsurface canal usually can be seen at the normal location of the lateral line or slightly above; small raised papillae with pores are also scattered on the body, some forming a row below the dorsal fin, another group usually can be seen above the anal fin, parallel to the lateral line).

Body shape and coloration as in figure 11. Head depressed, with mouth superior; eyes small, on dorsal surface, pointing mostly upwards, at least 4 eye diameters apart. Head with scattered low ridges, no deep pits on head. Head spines poorly developed. Preorbital bone with 2 lumps over maxillary. Four

FIGURE 11. *Pseudosynanceia melanostigma*, adult, SU 62409, 76 mm. S.L., West Pakistan. (Specimen tilted on left side.)

preopercular spines present. Other spines developed as ridges or absent. Small teeth on jaws and vomer, none on palatines. Vertebrae 26 (2 specimens) or 27 (1).

Coloration in preservative (fig. 11) brown or gray to black on a pallid background, lighter ventrally. Body darkest on caudal peduncle, then abruptly white at base of caudal fin. A broad subterminal brown or black bar on caudal fin, otherwise this fin pallid. A clear area on anterior part of soft dorsal fin extending onto body. Soft dorsal fin dark distally. Spinous dorsal fin with dusky pigment concentrated near distal part of spines. Pectoral fin mostly pallid with a broad dark bar distally, fin rays tipped with white. Pectoral axil mostly pallid, with a few dark specks or reticulations usually present. Anal fin mostly dusky, darkest posteriorly. Pelvic fin rays pallid below, dark distally, with tips of rays pallid. In life, pallid areas are yellow, according to Blevad and Løppenthin (1944) and Khalaf (1961).

Comparisons. See the 'Comparisons' section for *Leptosynanceia asteroblepa*.

Distribution. This species is restricted in distribution; it is known only from the Persian Gulf to western India. It is a marine and estuarine species living on mud bottom.

Genus **Trachicephalus** Swainson

Trachicephalus Swainson, 1839, pp. 181, 268 (type-species *Synanceia elongatus* by original designation).

Trichophasia Swainson, 1839, p. 61 (type-species *Synanceia elongatus* implied from text [see 'Nomenclatural remarks'].

Polycaulus Günther, 1860, p. 175 (proposed as a replacement name for *Trachicephalus* Swainson); Bleeker, 1874, p. 19 (description; nomenclature).

Uranoblepus Gill, 1861, footnote on p. 5 (proposed as a replacement name for *Trachicephalus* Swainson).

Nomenclatural remarks. As discussed by Gill (1905, p. 224) the replacement names *Polycaulus* and *Uranoblepus* were proposed because of the similarity of *Trachicephalus* and the earlier *Trachycephalus* (e.g., the reptile genus *Trachycephalus* Tschudi, 1838). Under the *Rules of Zoological Nomenclature* the two are etymologically different and *Trachicephalus* is not preoccupied.

Both *Trichophasia* and *Trachicephalus* were proposed by Swainson (1839) for the same category as evidenced from the text (p. 61, pp. 180–181, and p. 268) (see also our 'Nomenclatural remarks' under the genus *Synanceia*). Gill (1905, p. 224) appears to be the first to mention both names, and he selected *Trachicephalus* over *Trichophasia*.

Diagnosis. See 'Distinguishing features' in the species account below.

Trachicephalus uranoscopus (Bloch & Schneider).

(Figure 12; tables 3–5.)

Synanceja uranoscopa Bloch and Schneider, 1801, p. 195 (original description; type locality

Tranquebar, India; spelling of genus on p. 194 corrected to *Synanceia* on p. 573); CUVIER *in* Cuvier and Valenciennes, 1829, pp. 458–459 (brief description; remarks).

Uranoscopus indicus KUHL and VAN HASSELT *in* Cuvier and Valenciennes, 1829, p. 456 (nomen nudum); BLEEKER, 1849, p. 10 (as synonym of *Synanceia elongata*).

Synancya elongata CUVIER *in* Cuvier and Valenciennes, 1829, pp. 456–458 (original description; type locality Pondichery, India, and Java); BLEEKER, 1849, pp. 4, 10 (synonymy; brief description; range); 1861b, p. 72 (listed; Penang).

Synanceia elongata, CUVIER, 1837, p. viii, fig. 3 on Ichthyology pl. 27 (color plate).

Trachicephalus elongatus, SWAINSON, 1839, p. 268 (as type of *Trachicephalus*).

Synanceia breviceps RICHARDSON, 1845, pp. 71–72 (original description; type locality China); WHITEHEAD, 1969, pp. 205, 207 (types lost).

Aploactis breviceps, RICHARDSON, 1846, p. 212 (placed in *Aploactis*; location of specimens).

Synancia elongata, CANTOR, 1850, p. 1029 (synonymy; description; range).

Uranoscopus adhæsipinnis BLYTH, 1860, p. 142 (original description; type locality India, from Calcutta fish market [some counts of fin rays low, probably inaccurate]).

Polycaulus elongatus, GÜNTHER, 1860, p. 174 (synonymy; description; osteology; collection data); KNER, 1865, p. 120 (synonymy; description; range); BLEEKER, 1874, pp. 20–21, fig. 1 on pl. 2 (description; synonymy; range); 1879, fig. 2 on pl. CCCCXV (figure from Bleeker, 1874); SEALE, 1910, p. 286 (specimens from Borneo).

Polycaulis uranoscopus, DAY, 1875, p. 164, fig. 6 on pl. XXXIX (synonymy; description; range; good figure); HERRE and MYERS, 1937, p. 34 (2 specimens [SU 30872] from Singapore).

Trachicephalus uranoscopus, RUTTER, 1897, p. 81 (good description; specimens from China [SU 1758]); FOWLER, 1929, p. 613 (listed; 4 specimens from Hong Kong); 1931, p. 305 (specimens from Hong Kong; coloration; status of *Trachicephalus*).

Polycaulus uranoscopus, FOWLER, 1935, p. 153 (one specimen from Bangkok, Thailand; "agrees with Bleeker's figure of *Polycaulus elongatus*"); DE BEAUFORT *in* Weber and de Beaufort, 1962, pp. 102–103, fig. 29 (synonymy; description; distribution).

Trachycephalus uranoscopus, FOWLER, 1938a, p. 36 (two specimens from Tai Po, China, and two from Hong Kong).

MATERIAL EXAMINED.

CHINA

SU 1758 (6, 44.8–56.5), Swatow, A. M. Fielde. SU 25743 (2, 70.7–80.0), Canton, A. W. Herre.

HONG KONG

SU 9853 (2, 47.0–63.1), P. L. Jouy. SU 39608 (2, 63.5–67.2), Aberdeen Fish Market, A. W. Herre, 1 June 1937. Plus USNM 143296 (1).

SINGAPORE

SU 30872 (2, 19.6–53.8), A. W. Herre, 3 March 1934. SU 34090 (7, 37.0–62.3), A. W. Herre, 8 May 1937. SU 39472 (1, 59.0), Siglap, A. W. Herre, 18 October 1940. Plus USNM 142947 (1).

THAILAND

USNM 119657 (1, 40.5), Laem Sing, at mouth of Chanthaburi River, H. M. Smith, 17 July 1928.

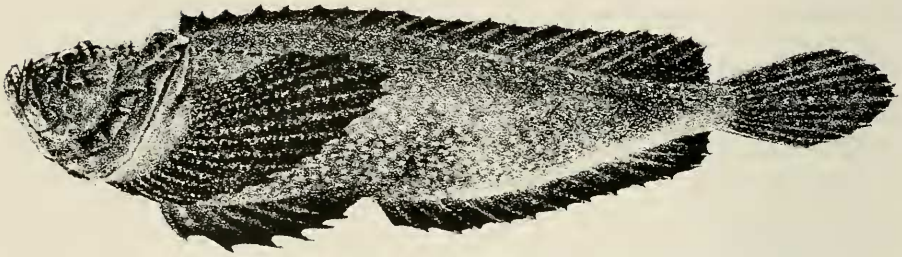

Figure 12. *Trachycephalus uranoscopus*, adult, India; figure from Day, 1875, fig. 6 on pl. 39.

India

SU 14671 (2, 36.0–45.0), Marmagao Bay, S. Kemp. SU 14672 (2, 68.8–72.2), Madras, Ennur Fisheries Station, A. W. Herre, 6 January 1941; MNHN A905 (3, 52.3–54.0, syntypes of *S. elongata*), Coramandel Coast, collected by Leschenault.

Distinguishing features. Dorsal XI–XIII + 12–14, usually XII + 12; anal II + 12–14, usually II + 13; pectoral 14–15; pelvic I + 5; all soft rays including pectoral rays unbranched; head depressed; eyes on dorsal surface of head, pointing mostly upwards; mouth superior; no deep pits on head; body without prominent warts.

Description. Dorsal fin with 12 (11–13) spines, all spines about same length, flexible, difficult to distinguish from soft rays. Dorsal soft rays 12–14, usually 12, with last single. Pectoral fin moderate, reaching to level of anal spines, with 14–15 unbranched rays. Anal fin with 2 spines and 12–14, usually 13, soft rays, last soft ray single. Pelvic fin base very long, reaching to level of vent, with 1 spine and 5 unbranched soft rays. Gill rakers rudimentary, total 7–8, 2–3 on upper arch, 5 on lower arch. Lateral line difficult to observe without microscope, runs high up on flanks; total tubes about 12–14, anterior ones more prominent and with small bilobed flaps; additional papillae (with pores?) scattered on body, a row present on body above anal fin and another above lateral line.

Body shape and coloration as in figure 12. Head depressed, with superior mouth; eyes small and on dorsal surface of head, pointing upwards and outwards, about 3 eye diameters apart. Head with scattered low ridges; two ridges run medially from eye, shallow occipital pit bordered by ridges, pit present between eyes but occupied by ascending arms of premaxillaries; another ridge passes under eye; no deep pits on head. Head spines poorly developed. Preorbital bone with 2 or 3 short spines over maxillary. Preopercular bone with 4 blunt spines. Other spines developed as lumps, ridges, or absent. Small teeth on jaws and vomer, none on palatines. Vertebrae 28–30, mostly 29.

Body mostly tan or brown in preservative (figure 12). Lateral line pores and

other pores on body sometimes surrounded by white. Distal portions of soft dorsal, anal, caudal, and pectoral fins darker brown except caudal fin tipped with white and with pale area on dorsal and on ventral margin of caudal at about middle of fin (better marked in small specimens).

Comparisons. See the 'Comparisons' section under *Leptosynanceia asteroblepa*.

Distribution. *Trachicephalus uranoscopus* occurs from western India to China and south in the Malay Archipelago to Borneo. This species is associated with mud bottom areas and some captures have been in estuaries.

Genus **Leptosynanceia** Bleeker

Leptosynanceia Bleeker, 1874, p. 17 (type-species *Synanceia asteroblepa* Richardson by monotypy).

Diagnosis. See 'Distinguishing features' under the species account below.

Leptosynanceia asteroblepa (Richardson).

(Figure 13; tables 3–5.)

Synanceia asteroblepa Richardson, 1845, pp. 69–71, figs. 1–3 on pl. 39 (original description; type locality New Guinea; compared with species of *Synanceia*); Bleeker, 1849, p. 4 (listed; New Guinea); 1852a, p. 242 (listed; New Guinea); 1852b, pp. 419–420 (description; rivers and estuaries of Borneo); Günther, 1860, p. 147 (compiled); 1868, p. 265 (listed; Sarawak); Vinciguerra, 1926, p. 539 (synonymy; listed; muddy rivers of Sarawak; range).

Leptosynanceia asteroblepa, Bleeker, 1874, pp. 17–18, fig. 2 on pl. 4 (as type of a new genus; description; specimens from Borneo; good figure); 1878, p. 49 (listed; New Guinea); 1879, fig. 6 on pl. CCCCXVI (figure from Bleeker, 1874); Fowler, 1928, p. 298, fig. 51 (brief synonymy and description; *L. greenmani* as a synonym); Herre and Myers, 1937, p. 34 (description; specimen from Sumatra, 100 miles west of Singapore [SU 30870]); Munro, 1967, p. 539 (in key; New Guinea).

Leptosynanceia greenmani Fowler, 1905, pp. 507–510, fig. 12 (original description; type locality Borneo; compared with *Leptosynanceia asteroblepa*; [holotype ANSP 114884, 2 paratypes ANSP 114885-6]).

Material examined.

Borneo

ANSP 114884 (1 specimen, 117 mm. S.L., holotype of *L. greenmani*), Baram, Borneo, A. C. Harrison, Jr., and H. M. Hiller, 1897; ANSP 114885 (1, 103, paratype of *L. greenmani*), and ANSP 114886 (1, 87.2, paratype of *L. greenmani*), Baram, Borneo, W. H. Furness, 1898.

Sumatra

SU 30870 (1, 49.7), 100 mi. west of Singapore, A. W. Herre, 27 March 1934.

Distinguishing features. Dorsal XVI + 5; anal III–IV + 5–6; pectoral 13–15, usually 14; pelvic I + 4; all soft rays including pectoral rays unbranched;

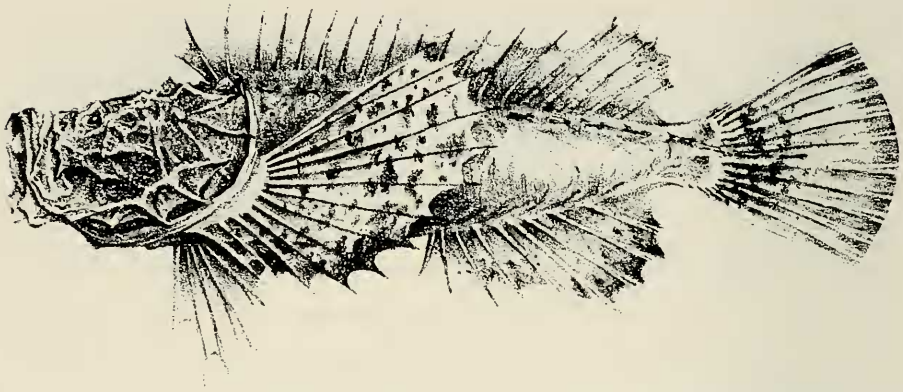

FIGURE 13. *Leptosynanceia asteroblepa*, adult, New Guinea; figure from Richardson, 1844, fig. 1 on pl. 39.

head depressed; eyes on dorsal surface, directed mostly upwards; mouth superior; no deep pits on head; body without prominent warts.

DESCRIPTION. Dorsal fin with 16 spines, all spines about same length, firm but of small diameter, with small venom glands at about midheight of spines. Dorsal soft rays 5, unbranched, last single. Anal fin with 3–4 spines and 5–6 unbranched soft rays, last single. Pectoral fin reaching to over anal spines, upper rays the longest, with 13–15 rays, all unbranched. Pelvic fin short, with 1 spine and 4 unbranched soft rays. Gill rakers rudimentary, 3 on upper arch, 8 or 9 on lower arch (in one specimen). Lateral line runs high up on back, with 11 tubes, last on caudal fin; additional papillae (with pores?) visible on body with microscope, a row of them present above anal fin.

Body shape and coloration as in figure 13. Head depressed, with mouth superior; eyes small and on dorsal surface of head, eyes pointing mostly upwards, about 3 eye diameters apart. Head with scattered low ridges; shallow pits present but none prominent. Most head spines poorly developed. Preorbital bone with 2 lumps over maxillary. Preopercular bone with 5 well marked spines. Opercular spines well defined. Other spines developed as lumps or ridges or absent. Small teeth on jaws, none on vomer and palatines. Vertebrae 28 (1 specimen).

Specimens available to us mostly faded. Fowler (1905) reports body pale brown, scarcely paler below, head finely mottled or marbled with darker brown, and back and sides with numerous large deep brownish blotches. Fins also similarly marked. Soft dorsal, anal, and caudal darker distally but with a white margin. Bleeker (1874) illustrates a brownish-yellow fish, mottled with large dark areas, fins dark distally, tinge of pink on fins.

Comparisons. The genera *Pseudosynanceia*, *Trachicephalus*, and *Leptosynanceia* each contain a single species. These species are more elongate (and resemble uranoscopid fishes in outward appearance) than the other more globular species treated in this paper. The pelvic rays are I + 3 in *Pseudosynanceia*, I + 4 in *Leptosynanceia*, and I + 5 in *Trachicephalus*. *Pseudosynanceia* resembles *Leptosynanceia*, and differs from *Trachicephalus*, in having a high dorsal spine count (usually XVI + 4 in *Pseudosynanceia*, XVI + 5 in *Leptosynanceia*, and XII + 12 in *Trachicephalus*). Significant differences in anal counts are also found (III + 7–8 in *Pseudosynanceia*, II + 12–14 in *Trachicephalus*, and usually IV + 5 in *Leptosynanceia*). These external differences are extensive and serve to distinguish the species from each other. A more detailed study is needed, but it would appear that these differences warrant separate genera for these species.

Distribution. We know this species only from Singapore, Sumatra, Borneo, and New Guinea. It is reported to inhabit estuaries and rivers.

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